

WHAT IS CLAIMED IS:

1. A method for increasing absorption of light radiation in a photo responsive device which comprises the step of forming a grating on the surface of said photo responsive device upon which light is incident such that higher grating orders are generated within said photo responsive device and the majority of the incident light entering said photo responsive device propagates obliquely to the surface upon which light is incident, thereby increasing light absorption by said photo responsive device close to the surface upon which light is incident.
2. The method as described in claim 1, wherein said photo responsive device is selected from the group consisting of solar cells and photo detectors.
3. The method as described in claim 2, wherein the solar cell material comprises silicon.
4. The method as described in claim 1 further comprising the step of forming a grating on the surface of said photo responsive device opposite to the surface upon which light is incident.
5. The method as described in claim 1, wherein said photo responsive device comprises silicon having a thickness of < 100 μm .
6. The method as described in claim 1, wherein said step of forming a grating comprises reactive ion etching.
7. The method as described in claim 6, further comprising the step of selective KOH etching to remove RIE-induced surface damage.
8. The method as described in claim 1, wherein said step of forming a grating comprises wet chemical etching.
9. The method as described in claim 1, wherein the grating comprises a rectangular grating.

10. The method as described in claim 1, wherein the grating comprises a triangular grating.
11. The method as described in claim 1, wherein the grating comprises a blazed grating.
12. The method as described in claim 1, wherein the grating is chosen to have optimal performance within solar cell spectrum.
13. The method as described in claim 1, further comprising the step of anti-reflection coating the grating surface.
14. The method as described in claim 2, further comprising the step of forming a junction in the solar cell using ion implantation.
15. A method for producing a solar cell having increased absorption of light which comprises the steps of: (a) forming a grating on the surface of said solar cell upon which light is incident; (b) removing surface contamination; (c) forming an n-type junction using gas source doping; and (d) forming n- and p-electrical contacts.
5
16. The method as described in claim 15, wherein said step of forming a grating comprises reactive ion etching.
17. The method as described in claim 16, further comprising the step of removing reactive ion etching-induced surface damage using wet-chemical etching.
18. The method as described in claim 17, wherein said step of wet-chemical etching comprises exposing the surface to KOH and nitric acid solutions.
19. The method as described in claim 15, wherein said step of forming a grating comprises wet chemical etching.
20. A method for producing a solar cell having increased absorption of light which comprises the steps of: (a) forming a grating on the surface of said solar cell upon which light is incident; (b) cleaning the surface to remove surface contamination; (c) forming an n-type junction by ion implantation; (d)

5 annealing the solar cell formed thereby; and (e) forming n- and p-electrical contacts.

21. The method as described in claim 20, wherein said step of forming a grating comprises reactive ion etching.

22. The method as described in claim 20, wherein said step of forming an n-type junction comprises ion implantation using $^{31}\text{P}^+$.

23. The method as described in claim 20, wherein said step of annealing the solar cell comprises heating the solar cell in an oxygen atmosphere.

24. The method as described in claim 20, wherein said step of forming a grating comprises wet chemical etching.

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